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Duplicate

# REPORT

ON A PROPOSED

## System of Sewerage,

FOR

ST. JOHN'S, NEWFOUNDLAND,

BY

RUDOLPH HERING,

CIVIL AND SANITARY ENGINEER, M. Am. Soc., C. E., M. I. C. E.  
ACCOMPANIED BY REPORT ON THE SAME, BY

CHAS. J. HARVEY, TOWN ENGINEER.

INCLUDING

## PLUMBING AND HOUSE DRAINAGE REGULATIONS,

TO BE ADOPTED.

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RUDOLPH HERING, M. AM. SOC., C.E., M.I.C.E.

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NEW YORK, March, 1889.

THE MUNICIPAL COUNCIL OF THE  
City of St. John's, Newfoundland:

GENTLEMEN,—

The following report upon a system of sewerage for the city of St. John's is respectfully presented:—

Your City Engineer, Mr. Chas. J. Harvey, before his arrival in this city, had well prepared himself with the necessary preliminary information in the way of topographical maps, profiles and other data upon which a recommendation for a plan of sewerage, can be based. Being thoroughly familiar with the local conditions he could readily answer all pertinent questions, and being well posted in the literature of the subject and in the designs elsewhere adopted and carried out, he was well able to thoroughly understand the principle features and the details of the work herein proposed. I have therefore every reason to believe that the subsequent recommendations and the manner in which Mr. Harvey may carry them out, are and will be substantially the same, as though I had myself visited your city and made a personal examination of the local conditions.

Inasmuch as we have thoroughly talked over the various matters pertaining to the design and construction of the work, it will only be necessary in the following pages to state the general points of most interest to yourselves.

The first question which it was necessary to settle, referred to the general character of the system best suitable for your locality.

As the city is built upon somewhat steep inclines, sloping on one side towards the harbor, and on the other towards a brook leading into Qudividi Lake, the rainwater can be most directly and economically disposed of into these two bodies of water at the nearest points.

The sewage, however, when constituting the waste waters from a population of 60,000 persons, which number it is considered prudent to provide for, should be discharged neither into the harbor nor into the lake; it must therefore be intercepted from its otherwise natural

course and carried to a point where it may properly be deposited. Such a point is to be found at Chain Rock. Here, at the narrowest point of the bay the tidal current will be strongest and a thorough dilution of the sewage will be obtained, making any artificial method of purification entirely unnecessary. Such artificial purification, whether it is secured chemically, by precipitating the suspended and dissolved organic matter, or mechanically, by a process of filtration through soil or other material, would not meet with permanent success and favor. The former method requires large tanks and machinery for preparing and mixing the added ingredients with the sewage, pressing the sludge, and perhaps also for pumping. The manurial value of the sludge is slight, and the net annual expense for conducting this process would therefore not be inconsiderable. Purification by filtration through natural soil is impracticable because no suitable territory exists, and filtration through artificial filters would be quite costly.

Adopting therefore the scheme of disposing the sewage in its crude state at Chain Rock, and of discharging the stormwater practically where it flows at present, it becomes a question whether sewage and stormwater had best be kept entirely separate, or first be allowed to enter the same sewers and then be separated by an intercepting sewer large enough to carry only the sewage to Chain Rock, the excessive flow due to rains escaping into the harbor and brooks. If you had no sewers at present and were troubled with flooding by stormwater, and if your streets were all paved, this question might have some weight, but as the rain water does not trouble you to any great extent, since a large number of channels are already provided for its removal, and as the streets are not paved, which necessarily allows a good deal of silt to wash into any underground sewers, I consider it unquestionably better to keep the sewage and road water in different channels. The flat grades that are necessary to take the sewage from the western part of the city to the outfall by gravity will cause rather a slight velocity, and if road silt were mixed with the sewage, there would be a considerable deposit of filthy matter besides an increased difficulty of keeping the sewers clean.

I therefore recommend to you the so-called "separate system" and shall hereafter refer only to the sewers for foul and sewage water, leaving the question of street water removal untouched. As to the particular kind of separate system, I prefer that which is modelled after the principles laid down by Sir Robert Rawlinson, C.B., late Chief Engineer of the Local Government Board, England, and not after those adopted by Col. G. E. Waring, Jr., in several cities of the U. S. The reasons I have, are the same which are contained in sundry articles of a late discussion in the Engineering and Building Record and in Engineering News of this city, and of which Mr. Harvey has copies.



For the following reasons, I advise you to proportion the sewers of a sufficient size to receive, besides the sewage, also some rain water. It is a great convenience to property holders to take the roof water into their drains, and it furthermore assists in flushing them, while the simultaneous entrance of this water all over the system causes the main sewers likewise to get a good flushing—a better one than can be obtained in an artificial way.

From the data in the possession of Mr. Harvey, I concluded that it would be proper to allow for 0.75 cu. ft. per sec. per acre of roof surface to reach the sewers at one time, and for 20 per cent. of the area along the business streets and 10 per cent. of the remaining area to be covered with roofs. The intercepting sewer was calculated to receive only as much rain water as the maximum quantity of sewage. This was assumed at 12.5 cu. ft. per sec. for 60,000 persons, on a basis of a water supply of 75 Imp. galls. per head per day.

The smallest size for a sewer I usually advise as 8" diameter. But as you can more conveniently purchase 9" pipe from England, it is better to use this larger size.

There is no difficulty in your city of obtaining good grades for all of the sewers, excepting the one along Water Street. For this I have suggested a fall of 1:1,000, as a minimum. The depth of the sewers below the street surface should, as a rule, be sufficient to allow of the cellars being drained. The courses of the sewers, which a careful investigation has shown to be the best, are marked upon the map. As before mentioned, the outfall is placed at Chain Rock. To it leads the circular main outfall sewer from Temperance Hill, 3 ft. 6 ins. in diameter, receiving at this point the sewage from 3 main sewers; one coming from Circular Road, 24 ins. diameter or its equivalent egg-shaped form if built of brick; another from Military Road, 12" in diameter; and a third, from Water Street. The latter is the intercepting sewer, collecting all the sewage which would otherwise enter the harbour. It is egg-shaped, with a rather large radius for the invert, and decreasing in size from 2'4" by 3'6" to 12" near Flower Hill and New Gower Street. Near Cathedral Hill it receives the sewage from a main sewer coming down Long's Hill.

The assumed min. grade for the intercepting sewer does not allow it to drain property further West than Queen Street. The area lying beyond, between Water Street West, Hamilton Avenue and New Gower Street cannot be drained to the proposed outfall by gravity on any grades that will give a satisfactory flow. This area will therefore either have to be drained into the head of the harbor, or its sewage will have to be pumped into the intercepting sewer at Queen Street. I believe that for some time there will be so small an amount of sewage from this district that a discharge into the harbor will not be objectionable, if an outfall pipe is carried to the head of the pier at Springdale Street to deep water. Later, a steam pump, Shone ejector,

or other motor, will have to be used to lift this sewage into the high-level sewer at Queen Street.

In regulating the house drainage of this low, level district, it will be well to limit the amount of roof water entering the sewer as much as practicable, to avoid the expense of pumping the same.

The alignment of the sewers should be carefully made on the Rawlinson principle of right lines between man-holes, curving entirely within the latter, in order to allow of a complete inspection of the entire system at any time. The pipes should be laid perfectly straight to lines and grades, so that a light held at one man-hole may be seen from the next one. The curves should be made even and smooth, so as to prevent all deposit. The brick sewers, which are large enough to enter, should be curved on larger radii.

As the main sewers are calculated to carry a good deal more rain water than the intercepting sewer, overflows or reliefs are necessary opposite or near their intersection. Where these can be so arranged that the old sewers can take this surplus water, it should, of course, be done; otherwise, new overflow sewers must be built. The point at which the overflow begins should be at least  $\frac{3}{4}$  of the height above the invert. The rising water during a rain, first flushes most of the filthy water ahead to out-fall, and the flow that comes after, is considerably more diluted than ordinary sewage, and can temporarily be allowed to escaped into the harbor generally without being noticed.

The overflow sewer proposed at the foot of Temperance Hill, should be carried to the head of the pier, where it can be used as the out-fall of the entire system for a number of years, saving for such a time the expense of the out-fall sewer to Chain Rock. As soon as it is found that the quantity of sewage delivered, is too great to safely flow out so near the city, then the more distant out-fall must be resorted to. The proposed grades will admit of such an extension without difficulty.

It has already been indicated how the system can be inspected and examined. It remains to state how it can be cleaned. It will hardly ever be necessary to clean it otherwise than by flushing. If so, however, brushes and scrapers can be pulled or pushed from man-hole to man-hole. Flushing of the branch sewers is done by building suitable basins, like man-holes, at the heads, and providing them either with automatic flush tanks, as supplied by the trade, or with flap valves which can be drawn by hand after the basin has been filled with water from a water cart or a hose. Unless there is an abundance of water at your disposal, I think flushing by hand will be quite as satisfactory, if not more so, as it requires much less water.

The intercepting sewers and the larger of the main sewers should be provided with pen-stocks, placed once in about 2,000 feet, which can store up the sewage when desired, and by a sudden opening cause the penned-up water to flush the sewer both above and below it.

At several points it is possible to make arrangements to admit the water from brooks and thus to temporarily increase the flow and to cause a flush. For instance, the high level sewer can be flushed in this manner with water from the brook at Carter's Hill; and the low-level sewer can be flushed by the brooks from Monday's Pond and at Springdale Street, the latter flushing the temporary outlet.

The ventilation of the sewers is of great importance both to facilitate the rapid dilution and removal of sewer-air, and to prevent the drawing or blowing out of the traps, connected with the system. The air in the sewer must, therefore, have a free communication with the atmosphere. Usually this is obtained by perforating the man-hole covers, in which case a dirt box must be suspended beneath them where the sewers have steep grades as in your city. I think it will be advisable also to have special vent pipes carried from the highest points or dead ends of the sewers up to the roof of the near buildings. The arrangement of the streets makes it possible to connect the higher ends of a number of branch sewers with a main sewer crossing its direction, and thus to secure a better circulation of air and also a flush from the main sewer when desired.

These methods of ventilation are the most common and the least expensive, and if the sewers are well flushed, they do not give any cause for complaint.

To get the greatest possible benefit from a system of sewers, it is necessary to give a careful attention also to the drainage of houses. Regulations governing the arrangements should be established and the inspection of the plumbing placed in the hands of the engineering department. Such regulations and rules are adopted in a large number of cities with great advantages to the communities. So far as the street sewers are concerned, it is necessary to require that the house drains, when built of glazed terra-cotta pipe, shall be laid 6 inches in diameter from the outside of the house to the sewer. They may be 4 inches in diameter if of cast iron. All pipes inside of the walls of the house should be of iron or lead and never of terra-cotta.

In a system of sewers there are numerous details to be considered both in the design and in the construction. It is of the greatest importance to give them all the attention practicable, because a system may partially fail of its true purpose for want of such attention.

The materials used should be of the best to secure permanency of the works and the labor should be faithful throughout, not only to secure strength, but also to secure a smooth interior surface against which the sewage is to run, and regular curves with no chance for deposits at junctions or wherever the sewer changes direction.

Very respectfully,

RUDOLPH HERING.

REPORT ON A PROPOSED SYSTEM OF SEWERAGE FOR  
THE CITY OF ST. JOHN'S, NEWFOUNDLAND, BY  
CHARLES J. HARVEY, CITY ENGINEER.

TOWN ENGINEER'S OFFICE,

ST. JOHN'S, N.F., April 17th, 1889.

*Mrs. Chairman and Members of the Municipal Council of St. John's:*

The following on the question of a new sewerage system for the town of St. John's is respectfully submitted for your consideration.

According to instructions received from the Council, I carried out a preliminary survey of the town for sewerage purposes. Beginning on the twentieth of November last, operations were confined principally to portions previously unsurveyed and to taking levels in all the streets so as to ascertain accurately the grades and other necessary information. Work ceased on this survey on the thirty-first of December. With the aid of Mr. O'Meara I then prepared the plan, profiles and other data requisite for determining the best mode of sewage disposal adapted to the needs of this town. In compliance with a resolution unanimously adopted by the Council on the 15th of February, I left here for New York, to consult an engineer on this important question. I had previously corresponded with Mr. Rudolph Hering and ascertained that he was at leisure and willing to act in the matter as consulting engineer. Leaving St. John's on the nineteenth of February last I reached New York on the twenty-sixth. Owing to Mr. Hering's absence from the city I did not see him until the first of March. After that date I spent considerable time with him, and went thoroughly into the whole matter of the disposal of the sewage and the details of an efficient system of sewerage which it would be necessary to adopt. Mr. Hering approves of what is called the "separate system" on the English or "Rawlinson" principle, which was the one I recommended to you last fall during the discussion which was held on this matter at the time of commencing the survey.

As there appears to be an idea held by some of the citizens that it is unusual to consult an expert on these matters, I think it advisable to refer to some recent examples which show that it is a common custom for a City Council to call in consulting engineers to determine questions connected with sewerage &c. A very recent case is that of Toronto, where there is a large and able staff of engineers connected with the water-works and sewerage departments. Yet when the question of improving their water supply and sewerage came up, the



City Council called in two American engineers to solve the problem, who were paid four thousand dollars each for their services. One of these gentlemen was Mr. Hering, who I have no hesitation in saying stands as one of the foremost sanitary engineers of the present day. Kingston, Jamaica, is another city, where the Council employed two consulting engineers on the sewerage question, and many towns could be further cited both in England and America, which have pursued, a similar course, such as Chicago, Philadelphia, Waterbury, Coventry, Croyden, &c.

#### PROPOSED SYSTEM OF SEWERAGE.

There is no need here to enter into the old controversy of "separate" versus "combined" systems. Suffice it to say that the "separate" system has so much to commend it here both on account of local topographical features and on the score of economy that there can be no hesitation in deciding to adopt it.

#### OUT-FALLS.

Mr. Hering agrees with the engineers, who previously reported on this question, in selecting Chain Rock as a suitable place where the out-fall sewer may discharge. The larger portion of the sewage can be discharged by gravitation to Water Street at its junction with Temperance Hill, whence it will be led away by the circular out-fall sewer built of brick and forty-two inches in diameter. The distance from Temperance Hill to Chain Rock is about three thousand feet, while the grade will be one foot in a thousand. The invert is at high water mark at Temperance Hill, while at Chain Rock it will be six inches above low water mark. The cost of this out-fall sewer will be very heavy as the whole of it has to be constructed through solid rock (part of it in tunnel). I estimate the cost of it at not less than thirty-six thousand dollars, \$36,000. But as the quantity of sewage is such, that it is unlikely to cause any nuisance if discharged temporarily at the Railway wharf, as mentioned before, a temporary out-fall may be constructed there, which would answer the requirements for many years, leaving the costly out-fall sewer to Chain Rock to be constructed at some future time when it is found necessary. Another temporary out-fall will be necessary at Tessier's Cove to discharge the sewage of that portion of the town which lies too low to be drained by the intercepting sewer in Water Street East. This out-fall could be dispensed with in future by putting in a pumping engine or other lifting apparatus to raise the sewage to the level of the intercepting sewer at Queen Street. It will be noticed that chemical treatment of sewage is not considered necessary at all, and is also very objectionable on the ground of expense.

#### AREAS AND MAINS.

The plan now submitted to your notice shows the various mains, intercepting and lateral sewers with the sizes and grades.

The town may be divided into five areas for sewerage purposes.

*1st Area.*—The portion of the town bounded by Water Street West on the South by Hamilton Avenue, and New Gower Street on the North, Queen Street on the East, and extending West as far as the city limits. This area, as mentioned before, cannot be drained by gravitation to the eastern end of the harbor owing to the configuration of the ground. The main sewer in this Area is a pipe sewer in Water Street West, of twenty-four inches diameter at Springdale Street, thence diminishing to 14 inches at Patrick's Street, and to 9 inches at the junction of the Topsail and Bay of Bulls Roads.

*2nd Area.*—This includes the portion of the town lying north and east, of No. 1, bounded on the North by the summit of the ridge separating the Harbor and the River valley in rear of the town, and on the east by Fresh Water Road, Longs Hill, Cathedral Hill and Market House Hill. There are two mains in this area. One in Water Street, an egg-shaped brick sewer varying in size from 1'-10" x 2'-9" to 2' 0" x 3'-0". The other is a pipe sewer twelve inches diameter to be laid down Longs Hill, Cathedral Hill and Market House Hill to the junction with Water Street. All lateral sewers in this and the first area are nine inch pipes.

*3rd Area.*—This adjoins No. 2, extending from the summit of the ridge above mentioned to Water Street, and bounded on the east by the Railway and Temperance Hill. The principal main in this area is the egg shaped brick sewer in Water Street, from Market House Hill to Temperance Hill, varying from 2' x 3' to 2'-4" x 3'-6". Another main is a twelve inch pipe to be laid from Prescott Street along Duckworth Street, and down Gambier Street to Water St. The third main is a twelve inch pipe in Military Road beginning at Carew Street, thence to Duckworth Street, and along the latter to Temperance Hill.

*4th Area.*—This occupies the northern slope of the ridge between the Harbor and the valley of the river flowing into Quidi Vidi Lake, extending from the City Limits in the West to the Church of England Cemetery in the East. The main in this area is a twelve inch pipe in Circular Road commencing at Allandale Road, thence along the former to Rennie's Mill Road; thence along Rennie's Mill Road a short distance to the Railway Track. Here it changes in size and shape and is an egg-shaped brick sewer 1'-8" x 2'-6" following near the Railway Track to Temperance Hill.

*5th Area.*—This lies on the Western slope of Signal Hill, including Signal Hill Road, Quidi Vidi Road, and part of Forest Road. This area and the balance of the other areas where the laterals are laid will be drained by nine inch pipes.

#### DEPTH AT WHICH SEWERS WILL BE LAID.

The depth varies owing to the topographical features of the ground, but as a rule the inverts will be laid at a depth of nine feet below the

surface of the streets, so as to give a good grade to the house-drains and drain the deepest cellars. This however cannot be done in Water Street in those places where the elevation of the street is so slight above sea-level. On the other hand in the eastern portion of Water Street the depth will be considerable, varying from twenty to twenty-eight feet. If rock occurs at such depths tunnelling will probably be cheaper than open trenches.

#### ALIGNMENT.

The brick sewers, where large enough to be entered, may be curved round the street corners or bends, but the smaller brick and the pipe sewers will be laid in perfectly straight lines from man-hole to man-hole. All vertical or horizontal changes of direction in the sewers will be made in the man-holes. Junctions of two or more sewers will also be made in the man-holes with a curved groove in the floor to facilitate the flow. Junction Blocks will be inserted in the brick sewers and pipe junctions in the pipe sewers for each house, so that no trouble will arise in future when it is necessary to connect a house-drain with a public sewer.

#### SIZE.

The question of the size of the sewers is an important element in the cost of a sewerage system. By reducing the size of the sewers it naturally follows that there is a reduction in cost. The minimum size of sewers has often been discussed, but it is out of the question to reproduce the arguments *pro* and *con*. in this report. I shall simply and briefly show the actual results of experience with pipe sewers in other cities. Mr. Hering holds the opinion of most engineers of the present day, namely, that no pipe sewer in a street should have a less diameter than eight inches. While it is true that many of our streets could be drained by pipes of six inches diameter, as far as house-drainage alone is concerned, yet this size has not been found to work satisfactorily in the experience of other cities. Here I may mention that there is a certain variety of the "separate" system, known in America as the "Waring" from the name of the engineer, Col. Geo. E. Waring who took out patents for it. The features of this system are, small pipe sewers, omission or scarcity of manholes, shallow depths for the sewers, and the total exclusion of the rainfall. The experience of Memphis, Tenn., where this system was adopted nine years ago, proves that it is open to very grave objections. From the report of the engineer in charge of the sewers there it appears that there were 229 stoppages in two years, costing for removal \$2,509.00, all of the stoppages but two occurring in the six inch pipes. Owing to the very shallow depth at which the street sewers were laid the house-drains have not sufficient grade to keep clean and fully 2,000 stoppages took place in them in one year. Forty-four manholes have had to be constructed as they were found indispensable owing to the

frequent necessity for examining and cleaning the pipe sewers. I quote the following from this report :

"The general omission of manholes in the original system was a mistake which we are now correcting. Time has fully shown that direct means of access to the sewers, both main and lateral, are requisites; and such means are only supplied by manholes. It is suggested that these be built at every intersection throughout the older system as rapidly as possible, and be so formed that they become no obstacle to the flow. In extension of our system we shall rid ourselves of another defect, that lying in changes of gradient and alignment, by making all changes of direction at manholes, connecting them only by lines that shall be straight and smooth \* \* \* If we have been taught anything by our experience it is the fact that mere lines of piping do not constitute a system of sewerage." This is the earnest language of an engineer (Mr. R. F. Hartford) who has had charge of the sewers of Memphis for some considerable time.

The following is quoted from Sir Robert Rawlinson's criticism on the report by Col. Geo. E. Waring, Jr., on the proposed system of sewerage for Kingston, Jamaica, both gentlemen being consulted by the authority of the Mayor and Council of that City. It will be seen that Sir Robert Rawlinson, the foremost authority in England, condemns *in toto* the system of Waring in any points where it differs from the best usual English and American practice.

"In the city of Memphis Col. Waring *for the sake of economy* took a bold step in attempting to reduce the cost of main sewerage to a minimum, and I honor him for the attempt, but I do not approve of his practice for several reasons.

Because he adopted a diameter too small for street sewers, which I consider should never be less than nine inches, in place of six.

Because he dispensed with man-holes and lamp-holes as used in England as being unnecessary, and for Memphis, too costly.

I do not approve of limiting tributary (or house) drains to four inches diameter.

I object altogether to the shutting out of roof water and surface water from the precincts of houses, both of which I would take in.

I consider that his sewers would be under-ventilated if the main sewers are without man-holes and lamp-holes \* \* \* \*

"And here I may again state that I would not go below nine inches in diameter with side-branches to houses of six inches diameter and house junctions of four inches. All the sewers to be right lines and to have true gradients with man-holes and lamp-holes alternately, each having a movable cover to suit the road and street pavement."



I quote these to show how valuable it is to have the benefit of the experience of other cities in sewerage matters as any decision reached is so thoroughly borne out by facts. In connection with Memphis I may say that I had a letter from Mr. Hartford in which he states that it has become necessary to take up portions of the six inch pipes and re-place them with larger.

The town of Croydon, in England, had a more unfortunate experience in the matter of small pipe sewers than even that of Memphis, which is fully described in Baldwin Latham's Book on Sanitary Engineering.

#### CATCH BASINS OR STREET GULLIES.

These should be built at street intersections to catch the rainwater flowing down the surface drains and lead it into the underground channels provided for it. Many of the old sewers, if properly repaired or reconstructed, will answer for the conveyance of this surface water, though not at all adapted for sewage. It cannot be too clearly remembered that the street gullies are very necessary to catch the solid materials, road detritus, &c., washed down in rainfalls. It is the want of these which has led and is still leading to so many serious stoppages in the old sewers and to their being in such a filthy condition. These catch-basins should be built of brick of such sizes as are necessary according to locality. If of brick they will cost about \$30 each, but if some of Doulton's earthenware street gullies were imported they would only cost about \$18. The latter, however, are too small to be placed anywhere but on flat grades. It is probable, concrete gullies could be built cheaper than brick.

#### LOCATION SURVEY.

A location survey is now needed to fix exactly the position of each sewer that may be required to be built, to show its grades, the depth of cut, number of manholes and the design for each, ascertain the nature of soil and all other information necessary for construction in order to carry it out successfully. Reference marks will need to be put in and planks or other means of fixing centres and grades. Such survey is absolutely essential before anything can be done in the way of construction, and I would advise that a number of the sewers be first located before beginning any building so as to give time for proper inspection and superintendence when actual work is commenced, as it will be difficult to afford time for survey work after that.

#### CONSTRUCTION.

To make a sewerage system successful it is absolutely necessary that none but the best materials should be used. As a large proportion of the materials will have to be imported, it follows that the freight and expenses of handling in the case of inferior articles is

just the same as in the case of the best, consequently no economy whatever is obtained by importing the former. Therefore none but the best hard-burned and regularly shaped brick should be used, while the cement should be the best Portland to make a strong mortar capable of setting hard to withstand the erosion caused by constant running water. Invert blocks of stoneware are very much to be recommended. They are hard and smooth, wear well, and give a free and easy flow for the water, as the number of joints is so largely reduced. They also facilitate construction and thereby economize time, especially in wet ground.

The pipes should be the best vitrified sewer pipes and will be jointed with Gasket and Portland cement.

The trenches in the case of earth excavation should not be opened in lengths exceeding two hundred feet. In rock-work not less than fifty feet should be opened at a time. Open trenches will be made as a rule except in case of a deep rock cut where tunnelling might prove cheaper. These trenches will be timbered and shored to prevent sliding in of earth where it is found necessary. Grade planks or sight-rails will be put across the trenches, from which line and grade may be given.

#### FLUSHING.

In order to keep the sewers thoroughly clean and to remove obstructions it is necessary to provide means of flushing them. This can be accomplished in several ways. Thus certain man-holes can be fitted with a stop-valve on the outlet and a tap to draw water from so as to nearly fill them with water. On suddenly opening the outlet the water rushes away and scours the sewer below the man-hole. At dead ends automatic flush tanks such as Field's, Mitchell's, or Rosewater's can be used with good effect. In Water Street the sewers can be flushed with water drawn from streams such as Monday's Pond Brook, Carter's Hill Brook, and the Brook near the Junction of Topsail and Bay of Bulls Roads, using pen-stocks to dam the water back at certain intervals. On raising the pen-stock the pent up water rushes through, cleaning the sewer above and below the pen-stock.

#### ESTIMATE OF COST

The following is an approximate estimate of the cost of completing the system as shown on the plan. It is evident that such figures are only an approximation, as there are many unforeseen contingencies likely to arise which may reduce or enhance the cost considerably. It is a matter of considerable uncertainty as to how much rock excavation may prove necessary, but a liberal allowance has been made in the estimate for this, and it is hoped this will not be exceeded. Another doubtful question is the amount necessary for repairing old sewers and providing culverts for the watercourses.

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Many devices have been invented for securing sewer ventilation, but the simple system of ventilating through the perforated covers of the manholes is found in practice to be the most effective, and if the sewers are efficiently flushed need never cause any offence. Manholes will be built at every change of alignment and grade and at every street inter-section. This will give a sufficient number to thoroughly ventilate the sewers. The ventilation of sewers is a very important point in a system, and every care should be taken to have it as nearly perfect as possible. The best authorities agree that it is not desirable to ventilate sewers through house-drains, but that a disconnecting trap should be placed on the house-drain between the sewer and the house-wall. Any exceptions to this rule should only be made under the most favourable conditions and where the materials and workmanship of the public sewer and house-drain are of the most perfect kind and the whole system subject to constant inspection.

I am fully convinced that the work can be most satisfactorily and cheaply carried out on the contract system. The Council however should purchase and supply all materials such as, brick, Portland cement, sand, sewer pipes, gasket, man-hole covers, and so forth, while the labor of excavation and back-filling, laying brickwork in sewers and man-holes, timbering trenches and all other incidental labor with the exception of laying and jointing the pipe-sewers should be put out to contract. The latter work of laying and jointing pipes, I would

prefer to have done by men engaged especially for the purpose under our own inspection. The specifications should be carefully drawn up, and the whole work subject to rigid inspection and approval by the City Engineer or his Deputy before being accepted by the Council. Tenders could be advertised for in local and foreign papers so as to secure good competition in the bids.

#### TESTING CEMENT.

The cement should be carefully tested for tensile strength, fineness, setting, weight, expansion or contraction. All these points would be designated in the specification, and the cement should come up fully to the standard therein required. A careful record of the cement tests should be kept, and not less than one barrel in five should be selected for testing before using.

#### INSPECTION.

An experienced mason or bricklayer will be needed on the work where a brick sewer is being built. He would inspect materials, check their delivery, record house connections, see that the masons kept proper line and grade, and otherwise supervise the work to prevent fraud being practised, or bad workmanship in the construction.

#### STORAGE.

It will be necessary that the Council should have a store in which materials and supplies could be kept, and a yard or shed to stow bricks and pipes. Such store should be on a premises where there is a wharf so that materials could be stored as soon as landed and only removed when needed in actual work, thus saving in cost of transportation.

#### WATER SUPPLY AND HOUSE DRAINAGE.

In conclusion, let me urge upon the Council and the rate-payers generally, that the success of a sewerage system depends very largely upon the condition of the houses, the amount of water supplied to them and the quality of the plumbing. It cannot be too clearly kept in view that the most skilfully designed and built system of sewerage fails in its object and is powerless against disease if filth and overcrowding or plumbing defective in materials and workmanship are prevalent in a city. That these conditions prevail largely in this town in many localities is well known to every one who has given the matter the slightest thought. I would therefore advise in future that as soon as a sewer is built in a street and house connections ready, a service-pipe should be laid on to every house in that street not already supplied with water, and an efficient system of plumbing to dispose of house wastes should also be connected properly with the sewer. If water could not be conveniently laid on to a house, a trapped yard gulley should be placed in the back-yard where house slops might be emptied, the gulley being properly connected with the street sewer. I am aware that there will necessarily be some trouble in extending the

water supply owing to the large waste of water now going on unchecked, but I am sure Mr. Martin can fully advise you on this matter and devise means for reducing this to a minimum. A capable plumbing Inspector should be appointed to superintend the house drainage and plumbing both for sewerage and water supply. The present condition of the plumbing in many houses is such that I would advise that this inspector should make a thorough examination of the various fixtures throughout the town, report on the same and point out the alterations or substitutions which are necessary to place these fixtures and the plumbing generally in a safe sanitary state. This would place these houses out of danger as far as connection with the old sewers is concerned. It is clear that the old sewers will have to be used in many places till replaced by newer and more efficient ones. New houses, of course, should be served with water and sewerage connections in conformity with the new regulations which I now propose should be enforced to control plumbing and house drainage in the future. The inspector would issue the permits for making connections with sewers and inspect all the work before it was covered in, making such tests as he deemed necessary. These rules are substantially the same as those adopted in all American cities where there is a Board of Health whose duty it is to regulate house-drainage and plumbing. Forms of application and permits should be drawn up and printed ready for the use of the Inspector and the householders. Plumbers should be licensed and give bonds to perform faithful work in accordance with the said regulations. Said license and bond to be filled in according to printed forms provided to accompany these regulations. I will further say that in a work of this kind it must naturally be expected that many unforeseen difficulties will arise causing trouble, delay and expense. But the urgency of the needed reform in the sewerage of the town will justify every effort put forward to improve its sanitary condition.

Respectfully submitted,

CHARLES J. HARVEY.



## ORDINANCE FOR PLUMBING AND HOUSE DRAINAGE REGULATIONS FOR THE CITY OF ST. JOHN'S.

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1.—Every person engaged in the business of a master and foreman plumber in the city of St. John's shall appear in person at the office of The Municipal Council and register his name, residence, and place of business, and in case of removal to make change in said register accordingly.

2.—Before any portion of the plumbing and drainage system of any building shall be constructed there shall be filed in the office of the Municipal Council a plan thereof, signed by the owner, showing the said plumbing and drainage system entire, from its connection with the sewer, cesspool or vault throughout the entire building, together with the location of all fixtures, traps, ventilating pipes, &c. Said plan must be approved and the name of the plumber attached thereto before any portion of the work shall be executed. Before any changes are made in the direction of pipes or location of fixtures they must first be approved, and said changes made on the original plan, on file. This regulation also applies to any extension or alterations of existing systems, with the addition that in such cases a plan of the old system as well as a plan of the proposed changes, must be filed in the office of the Municipal Council. Drawings and descriptions of the plumbing and drainage of buildings erected prior to the passage of this regulation may be placed on file in the office of the Municipal Council.

3.—When the plan of any plumbing and drainage system is filed in the office of the Municipal Council, a fee of Two Dollars will be charged to defray the expenses of inspecting the plans, of filing and superintending the testing of the work as provided in Section 40.

4.—The Plumbing Inspector shall be notified promptly by the plumber, when the plumbing and drainage work of any building, or any portion thereof, is completed and ready for inspection and testing. All inspections and testings shall be made as soon as possible after such notification. Any such system put in and covered without due notice to the Plumbing Inspector must be uncovered for examination at the direction of said Plumbing Inspector.

5.—No building or premises will be allowed to be connected with any sewer, cesspool or vault without a permit first obtained from the Town Engineer, and it is further required that permits shall be kept on hand during the progress of the work to which they relate, and that they shall be exhibited whenever required by the proper authorities.

REGU-

The conditions of this permit must be strictly complied with.

This regulation applies to all sewers, whether on private property or in public streets or alleys. Before laying the drain from the building to the sewer, cesspool or vault, and after the trench is graded, the bottom of the trench must be carefully rammed to avoid unequal settling of the drain. After the pipe is laid, as the trench is filled the earth must be tightly rammed as near as possible to its original compactness. Tunnelling is prohibited.

6.—When the ground is made or filled in, the drain extending from the sewer, cesspool or vault to the foundation wall, must be of extra heavy cast iron pipes, of such diameter as may be approved. Such pipes should be laid with the joints properly caulked with lead.

7.—When the soil consists of a natural bed of loam, sand or rock, the drain may be of hard salt glazed and cylindrical, 6 inch earthenware pipe, laid on a smooth bottom, free from all projections of rock. Each section must be wetted before applying the cement, and the space between each hub and the small end of the next section must be completely and uniformly filled with the best hydraulic cement. Care must be taken to prevent any cement being forced into the drain to become an obstruction. No tempered up cement shall be used. A straight edge must be used inside the pipe, and the different sections must be laid in perfect line on the bottom and sides. The joint must be first made by caulking with gasket.

8.—When a building is to be connected with the sewer, cesspool or vault, it must be connected by a drain not less than six inches in diameter, having a fall not less than  $\frac{1}{4}$  inch to the foot. Old drains can be used for new houses only when found by an inspector of the Municipal Council to conform in all respects to the foregoing regulations governing new drains.

9.—When there is no sewer in the street on which a building faces, and it is necessary to construct a private sewer to connect with a sewer on an adjacent street or avenue it must be laid outside of the curb under the roadway of the street, and not through yards or under houses, without a special permit from the Town Engineer.

10.—Pipe sewers must not be cut, house drain connections with pipe sewers must be made with Y branches. Where connection is made with brick sewers, a terra-cotta junction block must be used.

11.—All horizontal drains within and to a distance of six feet beyond the walls of buildings shall be of cast iron, with caulked leaden joints, or wrought iron screwed joints, and shall be so located as to be readily accessible for inspection. The house-drain within buildings shall be securely hung on the cellar-wall or properly suspended from the cellar ceiling, unless this is impracticable, in which case it must be laid in a trench, cut at a uniform grade, the bottom of which must be covered with hydraulic concrete, and walled up on the sides with brick, laid in hydraulic cement; said trench must also be provided with moveable covers. The house drain shall have a fall of at least  $\frac{1}{4}$

of an inch to the foot, and more if possible. When a pipe passes under the wall of a building there shall be a relieving arch, to prevent the pipe being broken by settling of the foundation. Said drains shall be provided with openings for cleaning purposes, the same to be closed by screw plugs. Any deviation from this clause can only be made by special permit.

12.—A running or one half S trap must be placed on the house drain at an accessible point near the house wall. This trap must be furnished with a hand hole for convenience in cleansing, the cover of which must be properly fitted, and made gas and air tight, with some suitable cement, properly applied.

13.—Every house drain shall have an inlet for fresh air, not less than four inches diameter, entering on the house side of the trap and leading to the outer air, opening at some place shown on the approved plans, not less than 10 feet from the nearest window. No cold air box for a furnace shall be placed so that it can by any possibility draw air from this inlet pipe.

14.—All cast or wrought iron pipes must be sound, free from holes, and when laid under ground shall have a uniform thickness of one quarter of an inch. When the building is over sixty feet high above the curb pipes of the following weights shall be used, with extra heavy fittings:—

|   |       |    |      |     |        |       |
|---|-------|----|------|-----|--------|-------|
| 2 | inch, | 5½ | lbs. | per | lineal | foot. |
| 3 | "     | 9½ | "    | "   | "      | "     |
| 4 | "     | 13 | "    | "   | "      | "     |
| 5 | "     | 17 | "    | "   | "      | "     |
| 6 | "     | 20 | "    | "   | "      | "     |

15.—All drain, soil, waste, vent and supply pipes shall be as direct and concentrated as possible, protected from frost and readily accessible for inspection and convenience in repairing. When necessarily placed within partitions or in recesses in walls, soil and waste pipes must never be covered except with woodwork, to be so fastened with screws (never nails) as to be readily removed.

16.—Every vertical soil and main waste pipe, must be of cast or wrought iron, and when it receives the discharge of fixtures on two or more floors it must extend at least two feet above the highest part of the roof or coping, except in the case of flat roof tenement houses, in which case it shall extend at least six feet above the roof, and said pipe shall have a diameter above the roof at least one inch greater than that of the pipe proper, but in no case shall it be less than four inches in diameter above the roof. No cap or cowl shall be affixed to the top of such ventilation pipe, but in tenement houses a strong wire basket shall be provided and securely fastened thereto. Each length shall be securely fastened, and in the case of each line of soil pipe it shall rest at its foot on a pier or foundation to prevent settling. All joints in cast iron drains, soil or waste pipes must be so filled with oakum and lead and hand caulked as to make them gas tight, and the

amount of lead used shall not be less than 12 ounces to each inch diameter of the pipe so connected.

17.—Horizontal soil and waste pipes are prohibited.

18.—There shall be no traps placed on vertical soil and waste pipes.

19.—All changes in direction in cast or wrought iron pipes shall be made with curved pipes and all connections with Y branches and one sixteenth or one eighth bends if possible.

20.—Soil waste and vent pipes in an extension must be extended above the roof of the main building when otherwise they would open within fifteen feet of the windows of the main house, or the adjoining house.

21.—The least diameter of soil pipe permitted is four inches. A vertical waste pipe into which a line of kitchen sinks discharges must be at least three inches in diameter, if receiving the waste of five or more sinks, and shall have two inch branches.

22.—Where lead pipe is used to connect fixtures with vertical soil or waste pipes, or to connect traps with vertical vent pipes it must not be lighter than the following weights:—

| 1               | inch in diameter | 6 | pounds per yard. |   |   |   |
|-----------------|------------------|---|------------------|---|---|---|
| 1 $\frac{1}{4}$ | "                | " | 7                | " | " | " |
| 1 $\frac{1}{2}$ | "                | " | 8                | " | " | " |
| 2               | "                | " | 10 $\frac{1}{2}$ | " | " | " |
| 2 $\frac{1}{2}$ | "                | " | 13 $\frac{1}{2}$ | " | " | " |
| 3               | "                | " | 16 $\frac{1}{2}$ | " | " | " |
| 4               | "                | " | 24               | " | " | " |

Air-pipes may be of standard wrought iron with steam fittings. Sheet metal will not be allowed.

23.—All connections of lead with iron pipes must be made with a brass sleeve or ferrule of the same size as the lead pipe, put in the hub of the branch of the iron pipe and caulked with lead. The lead pipe must be attached to the ferrule by a wiped or over-cast joint. All connections of lead, waste and vent pipes shall be made by means of wiped joints.

24.—Every water closet, urinal, sink, basin, wash tray, bath and every tub or set of tubs, must be separately and effectively trapped, except where a sink and wash tub immediately adjoin each other, in which case the waste pipe is not required to be separately trapped. Urinal platforms if connected to drain pipe, must also be properly trapped, and a supply of water so arranged as to always maintain the seal of said traps. In no case shall the waste from a bath, tub, or other fixture be connected with a water closet trap.

25.—Traps must be placed as near the fixtures as practicable, and in no case shall a trap be more than two feet from the fixture. Each and every trap shall be ventilated either by a special vent pipe of suitable size extending at least two feet above the highest part of the

roof of the house (or into a special pipe erected for ventilating purposes only, in which case the area of the special vent must be increased as it passes upward so as to correspond to the combined area of all branch vents passing into it) or by a vent pipe connected into the soil pipe above the highest fixture, or by some approved automatic vent. Approved mechanical traps may be substituted where it is necessary or advisable, but only on special permit from the Town Engineer.

26.—The vent pipe for each water closet trap shall be at least two inches in diameter, and for traps under other fixtures not less than one and one half inches. In all cases vertical vent pipes must be of cast or wrought iron.

27.—Special vent pipes must be extended two feet above the highest part of the roof or coping, the extension to be not less than 4 inches in diameter, to avoid obstruction from frost. These vent-pipes must always have a continuous slope, to avoid collecting water by condensation.

28.—No trap vent pipe shall be used as a waste or soil pipe.

29.—Over-flow pipes from fixtures must, in each case, be connected on the inlet side of the trap of the same fixture.

30.—Waste pipes from safes under fixtures shall not be connected directly with a soil pipe or sewer, but shall be run to act as a tell-tale ending over a sink or to the open air over a gully. The waste pipe from refrigerators shall not be connected with a soil, drain or waste pipe, but shall terminate over a sink or open tray the outlet from which has a ventilated trap.

31.—The sediment pipe from kitchen boilers must be connected on the inlet side of the trap of the same fixture.

32.—Water closets must never be placed in an unventilated room or compartment. In every case the compartment must be open to the outer air, or be ventilated by means of a shaft or air-duct.

33.—All water closets within the house must be supplied with water from separate tanks or cisterns, the water of which is used for no other purpose. A group of closets on the same floor may be supplied from one tank. Pan closets and hollow plunger closets are prohibited.

34.—Over-flow pipes from water closet cisterns must discharge into an open sink, or where its discharge will attract attention and indicate that waste of water is occurring; but not into the bowl of a water closet, nor directly into a soil or waste pipe, nor into a drain or sewer.

35.—Water closets, when placed in the yard, must be so arranged as to be conveniently and adequately flushed, and their water supply pipes and traps must be protected from freezing. The compartment of such water closets must be ventilated by means of slatted openings in the roof.

36.—All waste, overflow or vent pipes shall be of lead, cast or wrought iron.

37.—Rain water leaders, when placed inside of any building, must be of cast iron, with leaded joints, wrought iron screwed joints, or of copper, with soldered joints. When outside of the building and connected with the drain it must, if of sheet metal with slip joints, be trapped beneath the ground or just inside of the wall, the trap being arranged so as to prevent freezing. In every case where a leader opens near a window or a light shaft it must be properly trapped at its base. The joint between a cast iron leader and the roof must be made gas and water tight by means of a brass ferrule and lead or copper pipe, properly connected.

38.—Rain water leaders must never be used as soil, waste or vent-pipes, nor shall any soil, waste or vent-pipe be used as a leader.

39.—No steam-exhaust, blow-off or drip pipe from a steam boiler, shall connect with the sewer or with any drain, soil-pipe or waste-pipe. Such pipes must discharge into a tank or condenser from which a suitable outlet to the drain may be provided.

40.—Every new plumbing system, including those altered or extended, must be tested by the plumber, by the air, water or pepper-mint test in the presence of the Plumbing Inspector; all defective joints must be made tight, and other openings made impervious to gases. Defective pipe must be removed and replaced by sound pipe.

41.—Cellar and foundation walls must be rendered impervious to dampness, and the use of asphaltum or coal-tar pitch in addition to hydraulic cement is recommended for the purpose.

42.—Cellars and areas may be connected with a house drain by the use of trapped gulleys. All subsoil drains must be connected by the same kind of gully.

43.—Yards and open light courts must always be properly graded and drained. When cemented, flagged or paved they may be connected with a house-drain by means of a trapped gully. When unpaved they may be connected with a rain water channel, surface drain, or old sewer.

44.—No person shall conduct, or cause, or suffer to be conducted, any sewer under ground into any street where there is a public sewer, without having the same properly connected with such public sewer.

45.—Any person injuring, breaking or removing any portion of any catch-basin, covering-stones, man-hole or lamp-hole cover, or any part of any public sewer, or obstructing the openings to any catch-basin; and any person placing, throwing or depositing any offal, garbage, dead animals, brine or filth of any kind, in any man-hole, shall forfeit and pay a penalty of not less than ten dollars, nor more than one hundred dollars, for each and every offence.



46.—Every water-cock, bibb, tap or hydrant, attached to any water or service-pipe, connected with and supplied from the water works system of the town of St. John's, shall have legibly stamped thereon, in a conspicuous place, the name of the plumber, attaching the same to the pipes or service as aforesaid.

47.—The Inspector must be satisfied that all water-pipes are laid with due regard to freedom from danger of freezing, and every service-pipe must be provided with a stop and waste cock for each consumer, easily accessible, placed so as not to be endangered by frost, and so situated that the water can be conveniently shut off and drained from the pipes.

48.—For water-works pressure no lead pipe shall weigh less than the following:—

| $\frac{3}{8}$ in. | Internal Diameter | 4 lbs. per lineal yard. |
|-------------------|-------------------|-------------------------|
| $\frac{1}{2}$ " " | "                 | 6 " " " "               |
| $\frac{5}{8}$ " " | "                 | 8 " " " "               |
| $\frac{3}{4}$ " " | "                 | 10 " " " "              |
| 1 " "             | "                 | 13 " " " "              |

49.—Every master plumber who shall himself or by his apprentices, agents, or employees make any extension of, or alteration to, or shall remove any trap, pipe or other fixtures attached to the pipes of the water works, shall on the last day in the month in which such extension, alteration or removal is made, report the nature and extent of the same in writing to the Engineer of the Water Works Department upon printed forms to be supplied by said Department, the correctness of which report shall be attested by a statutory declaration to be made by the master plumber making such report.

50.—No plumber shall be allowed, without having first obtained a permit from the department, to open or shut off the street stop-cock connected with the service supplying any premises or buildings, unless in case of urgent necessity to prevent loss or damage from flooding, or to make necessary repairs, or to test their work, and shall in every such case leave the stop-cock open or closed as they may find the same; provided always that any plumber who shall commit any damage or injury to said stop-cock or the service-pipes of the department in so doing shall be responsible for the amount of such damage.

51.—Urinals with stop-cocks to be turned by hand, unless self-closing, will not be permitted to be attached or connected with the Water Works system of the Town of St. John's.

52.—Water Closets must be fitted to be operated by the regular water-closet valves of the different makes. The use of ordinary draw-cocks in connection therewith will not be permitted.

53.—No arrangement shall be made for supplying water-closets or urinals by common stop-cocks; and no arrangements shall be made for cleaning water-closets or privy vaults by waste-pipes from wash-basins

or sinks, or by any other means of evasion; but they shall be fitted up with the fixtures and appurtenances belonging to them respectively.

54.—No plumber shall be permitted to connect any two or more distinct premises, tenements or houses, with one service unless separate and distinct stop-cocks shall be placed outside each of such separate premises in the public alley or on the sidewalk opposite the same.

55.—No cesspool, privy vault, cistern or open gutter, shall be connected directly with a public sewer.

56.—Any person or persons or corporation offending against or violating any of the provisions of this ordinance shall, on conviction thereof, pay a penalty not less than \$10.00, or more than one hundred Dollars.

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### PLUMBER'S BOND.

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KNOW ALL MEN BY THESE PRESENTS, that we....., in the Town of St. John's, N.E., as principal and ....., as sureties, are held and firmly bound unto the St. John's Municipal Council, in the penal sum of ..... Dollars, to be paid to the said Municipal Council or to its certain attorney, successors or assigns.

For which payment, well and truly to be made, we bind ourselves and our heirs, executors and administrators jointly and severally, firmly by these presents.

Signed this ..... day of ..... in the year of our Lord, One Thousand, Eight Hundred and .....

Whereas, the said ..... of the first part has made application to be licensed to engage in the business of connecting private drains with the public sewers of the said Town which License has been granted, conditioned upon the execution of this bond, as provided by Ordinance, No. .... of the Municipal Council of said Town, passed .....

Now, therefore, the condition of this obligation is such. That if the said ..... of the first part shall well and faithfully and in a workmanlike manner, perform the work of connecting such drains, and shall save and indemnify the St. John's Municipal of the second part of and from all costs, damages and expenses arising from making such connections, or the negligence or carelessness of the said ..... of the first part, his agents, servants, or employees, in making the same, then this obligation to be void, otherwise to remain in full force and virtue.

Sealed and delivered in the presence of

.....  
 .....  
 .....

HERING, RUDOLPH  
Report on

Canadian  
pamphlet

### PLUMBER'S LICENSE.

TOWN ENGINEER'S OFFICE, St. John's, Nfld.

No. .... 188  
..... hereby licensed to do Plumbing and lay house drains in connection with public sewers in this town in accordance with the permission of an Ordinance No. .... fixing and regulating the use of sewers by private individuals in the Town of St. John's, N. F.

.....  
Town Engineer.

### OWNER'S APPLICATION.

FOR PERMIT TO CONNECT WITH PUBLIC SEWER.

To the Town Engineer or his authorized Deputy :

Please deliver to ..... permit for a ..... inch connection with the ..... sewer on ..... Street, for premises No. .... Street. I authorize him to sign for me such an application for the same as is required by the regulations of said Department.

..... 188

.....  
Owner.

### APPLICATION FOR PLUMBING.

To the Town Engineer :

No. .... 188

The undersigned applies for permission to connect premises No. .... Street with the public sewer in ..... Street, and to do the necessary plumbing, and I hereby desire a permit to be issued to ..... a regularly authorized and licensed plumber to construct such.

I hereby stipulate and agree that the work on said sewer shall be executed in strict conformity with the provisions of an Ordinance fixing and regulating the use of sewers by private individuals in the Town of St. John's, N.F., and the plans and specifications approved by the Town Engineer and now in force in the Town of St. John's, N.F. And the undersigned further agrees that all claims against the Municipal Council for damages occasioned in any manner by the putting in of said drain shall be waived and held null and void.

.....  
Owner.

### PERMIT TO CONSTRUCT SEWER.

No. .... 188

Authority is hereby given to ..... to execute the work for ..... upon the terms and conditions specified in above application.

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4 Feb

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engineer.

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